CLAIMS

1. A thermostat for providing an automatic changeover from a current mode to a new mode, the current mode and the new mode being alternate ones of a heating mode, in which the thermostat controls a heating system, and a cooling mode, in which the thermostat controls a cooling system, the thermostat comprising:

a sensor for measuring a sensed room temperature;

a processor coupled to the sensor for controlling the thermostat;

a memory coupled to the processor for storing variables and software for programming the processor; and

a heating, ventilation, and air conditioning (HVAC) interface coupled to the processor for controlling the heating and cooling systems,

wherein the processor is programmed to:

operate the thermostat continuously in one of the heating mode and the cooling mode;

complete a demand for one of heating and cooling in accordance with the current mode; and

after completing the demand, and until another demand occurs for one of heating and cooling:

repeatedly make measurements of a sensed room temperature;

determine, from the measurements, whether the sensed room temperature has finished a post-demand overshoot;

record an evaluation temperature, in response to determining that the sensed room temperature has finished the post-demand overshoot; and

decide whether to make the automatic changeover by periodically comparing the sensed room temperature with the evaluation temperature.

2. The thermostat of claim 1, wherein the processor is further programmed, after recording the evaluation temperature, to

adjust the evaluation temperature in accordance with future measurements of the sensed room temperature.

3. The thermostat of claim 1, wherein the processor is further programmed to:

detect whether the automatic changeover to the new mode, when made, will cause an immediate demand for one of heating and cooling in the new mode; and

delay the automatic changeover until the automatic changeover will cause the immediate demand in the new mode.

4. The thermostat of claim 1, wherein, when in the heating mode, the processor is further programmed to

make a downward adjustment to the evaluation temperature in response to determining that the sensed room temperature has fallen below the evaluation temperature.

5. The thermostat of claim 1, wherein, when in the heating mode, the processor is further programmed to

switch to the cooling mode in response to the sensed room temperature becoming greater than the evaluation temperature by a predetermined margin.

6. The thermostat of claim 1, wherein, when in the cooling mode, the processor is further programmed to

make an upward adjustment to the evaluation temperature in response to determining that the sensed room temperature has risen above the evaluation temperature.

7. The thermostat of claim 1, wherein, when in the cooling mode, the processor is further programmed to

switch to the heating mode in response to the sensed room temperature becoming less than the evaluation temperature by a predetermined margin.

8. The thermostat of claim 1,

wherein the HVAC interface includes a fan controller for controlling an air mover of the heating and cooling systems, and

wherein, when in the heating mode, the thermostat is subject to a substantial post-demand temperature overshoot when the air mover operated during the demand is stopped after completing the demand, and

wherein, prior to determining, from the measurements, whether the sensed room temperature has finished the post-demand overshoot, the processor is further programmed to

reduce the temperature overshoot by extending the operation of the air mover after completing the demand, for a duration determined by at least one of (a) a predetermined time period, and (b) a detection of a peak in the sensed room temperature after completing the demand and while the air mover is in extended operation.

9. The thermostat of claim 1,

wherein, when in the heating mode, the thermostat is subject to a substantial undershoot in temperature early in the demand, and

wherein the processor is further programmed, after the demand has begun, to

detect, from the measurements, whether the sensed room temperature has reached a minimum during the undershoot; and

after detecting that the sensed room temperature has reached the minimum, stop the demand when the sensed room temperature returns to a stop-early temperature that is less than the temperature at which the demand was initiated.

10. The thermostat of claim 1, further comprising

a user interface coupled to the processor for interfacing with a user,

wherein the processor is further programmed to:

cooperate with the user interface to allow the user to define and store in the memory a single setpoint temperature; and

utilize the single setpoint temperature as a target temperature for both the heating mode and the cooling mode.

11. A method in a thermostat for providing an automatic changeover from a current mode to a new mode, the current mode and the new mode being alternate ones of a heating mode, in which the thermostat controls a heating system, and a cooling mode, in which the thermostat controls a cooling system, the method comprising:

operating continuously in one of the heating mode and the cooling mode;

completing a demand for one of heating and cooling in accordance with the current mode; and

after completing the demand, and until another demand occurs for one of heating and cooling:

repeatedly making measurements of a sensed room temperature;

determining, from the measurements, whether the sensed room temperature has finished a post-demand overshoot;

recording an evaluation temperature, in response to determining that the sensed room temperature has finished the post-demand overshoot; and

deciding whether to make the automatic changeover by periodically comparing the sensed room temperature with the evaluation temperature.

12. The method of claim 11, further comprising, after recording the evaluation temperature,

adjusting the evaluation temperature in accordance with future measurements of the sensed room temperature.

13. The method of claim 11, further comprising:

detecting whether the automatic changeover to the new mode, when made, will cause an immediate demand for one of heating and cooling in the new mode; and

delaying the automatic changeover until the automatic changeover will cause the immediate demand in the new mode.

14. The method of claim 11, further comprising, when in the heating mode,

making a downward adjustment to the evaluation temperature in response to determining that the sensed room temperature has fallen below the evaluation temperature.

15. The method of claim 11, wherein, when in the heating mode, deciding whether to make the automatic changeover comprises

switching to the cooling mode in response to the sensed room temperature becoming greater than the evaluation temperature by a predetermined margin.

16. The method of claim 11, further comprising, when in the cooling mode,

making an upward adjustment to the evaluation temperature in response to determining that the sensed room temperature has risen above the evaluation temperature.

17. The method of claim 11, wherein, when in the cooling mode, deciding whether to make the automatic changeover comprises

switching to the heating mode in response to the sensed room temperature becoming less than the evaluation temperature by a predetermined margin.

18. The method of claim 11,

wherein, when in the heating mode, the thermostat is subject to a substantial post-demand temperature overshoot, when an air mover operated during the demand is stopped after completing the demand, and

wherein, prior to the step of determining, from the measurements, whether the sensed room temperature has finished the post-demand overshoot, the method further comprises

reducing the temperature overshoot by extending the operation of the air mover after completing the demand, for a duration determined by at least one of (a) a predetermined time period, and (b) a detection of a peak in the sensed room temperature after completing the demand and while the air mover is in extended operation.

19. The method of claim 11, wherein, when in the heating mode, the thermostat is subject to a substantial undershoot in temperature early in the demand, and

wherein the method further comprises after the demand has begun:

detecting, from the measurements, whether the sensed room temperature has reached a minimum during the undershoot; and

after detecting that the sensed room temperature has reached the minimum, stopping the demand when the sensed room temperature returns to a stop-early temperature that is less than the temperature at which the demand was initiated.

20. The method of claim 11, further comprising the steps of:

defining a single setpoint temperature; and

utilizing the single setpoint temperature as a target temperature for both the heating mode and the cooling mode.